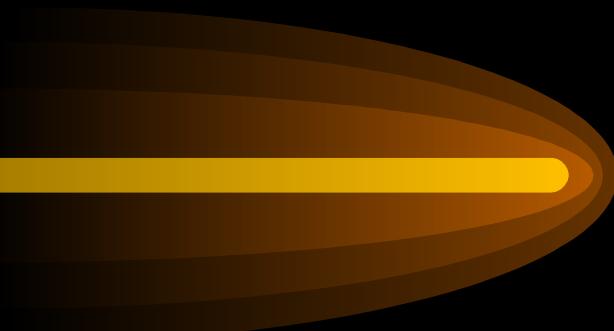


# Pressure Measurement in a 62 Caliber Cannon

# US Navy 5"/62 Gun



The retirement of the Iowa Class of Battleships has resulted in a shortfall of shore bombardment capability. This function is to be filled by longer range smaller caliber cannon based on the 5" Mk 45 and firing



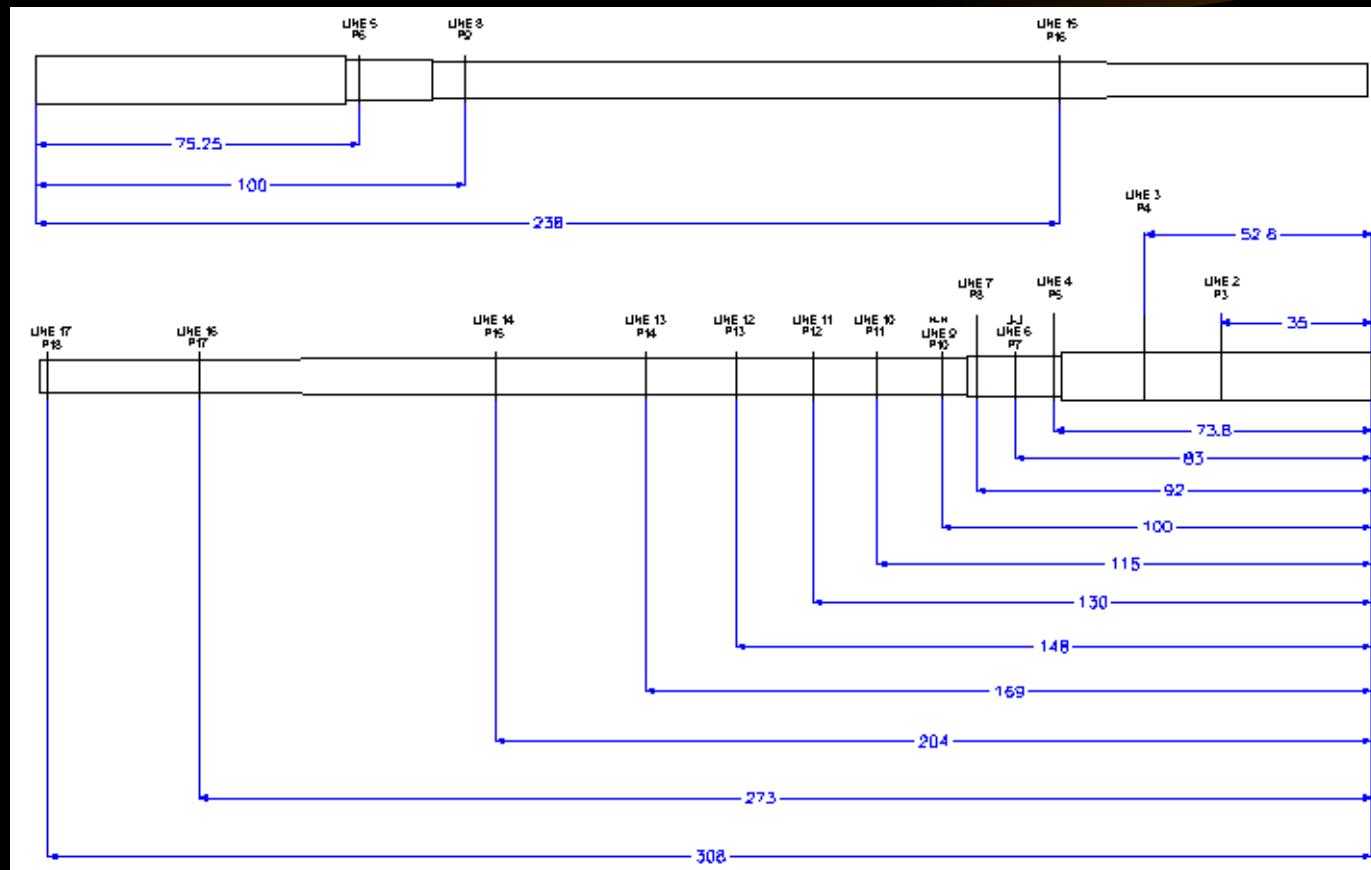
# Instrumentation Challenges



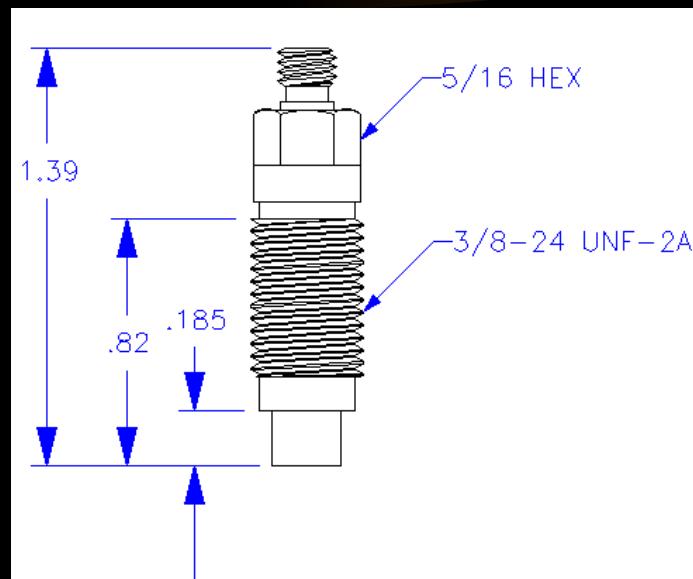
A horizontal bar at the top of the slide is composed of three overlapping bands: a dark blue band on the left, a light blue band in the middle, and a yellow band on the right. A large, stylized swoosh graphic originates from the right side of the slide, starting with a yellow band that curves upwards and then downwards, transitioning into a dark blue band that sweeps across the upper right quadrant.

- Provide reliable data
- Sensors must survive
- Sensor Maintenance must be low

# 16 Channels of Data - 14 Tube Mounted, 2 Breech Mounted

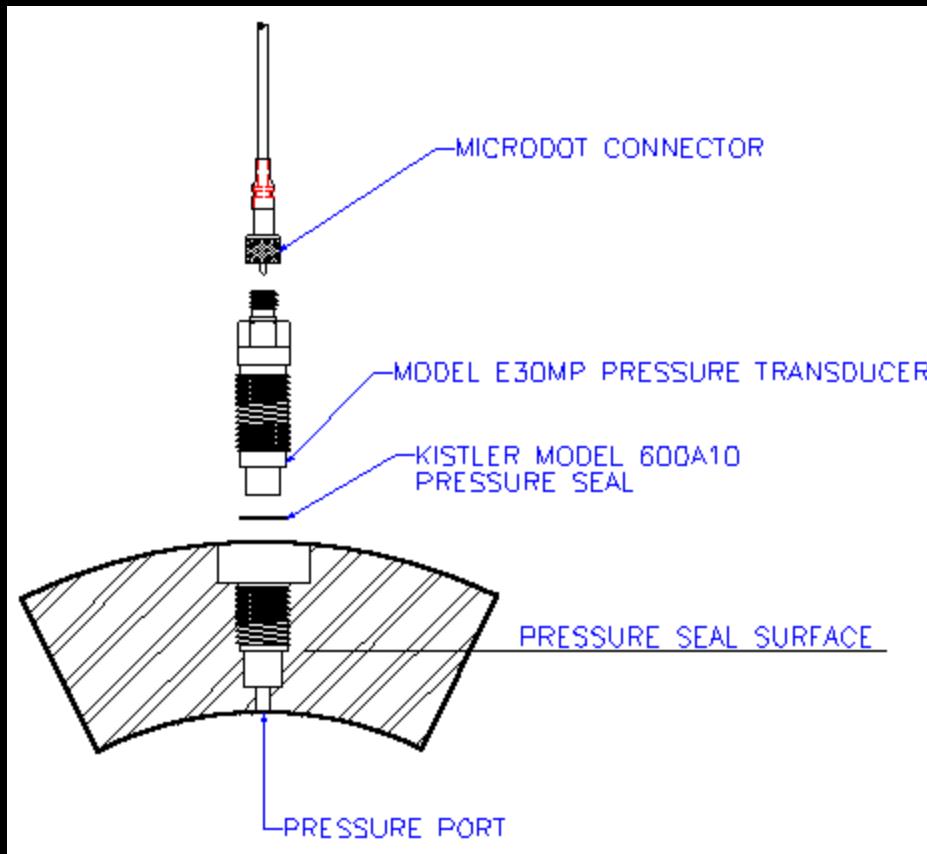


# Ballistic Pressure Transducers



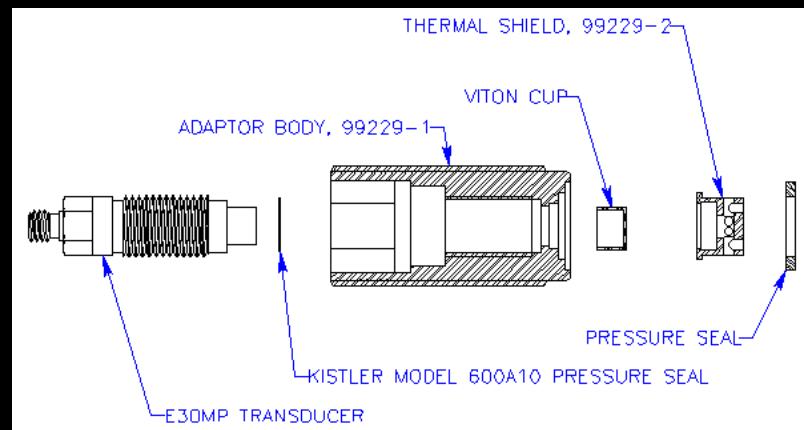
On the left, the Kistler Model 607 is a shoulder sealing Quartz based piezo-electric transducer. Problems with this gage led to the use of the similar E30MP. On the right, the US Army Model E30MP is a shoulder sealing Tourmaline piezo-electric transducer employing the same sensing element as the proven Model E30MA, but designed for use in the same envelope as the Kistler Model 607.

# Typical Installation

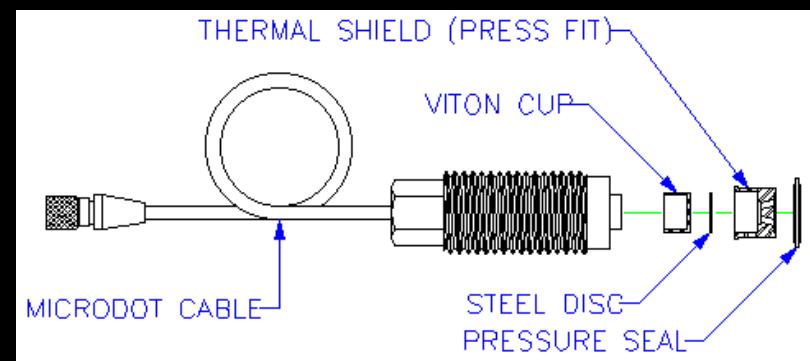


Thermal Protection for the E30MP had consisted of injections of Pennzoil 705 Grease before each round fired. Time between rounds was on the order of one hour for this action alone.

# Thermal Protection Adaptor



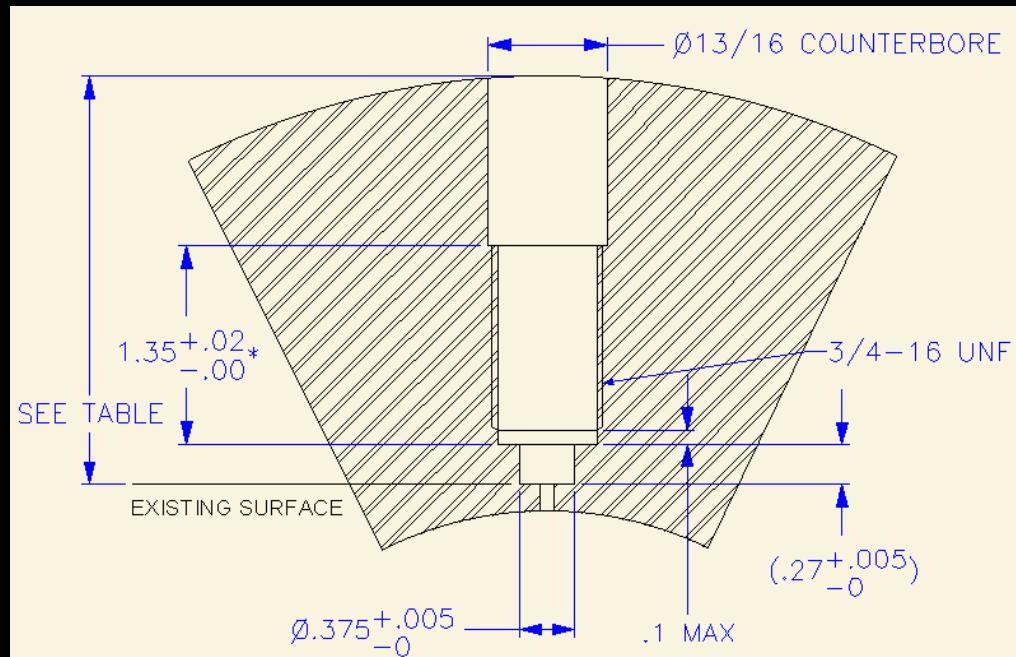
E30MP in Thermal  
Adaptor



150KFM Transducer

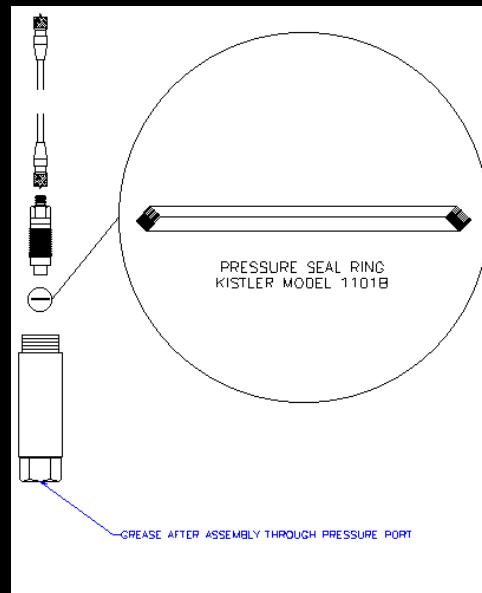
Thermal protection derived from transducers  
developed for the US Army Advanced Field Artillery  
System.

# Cannon Tube Modification



Twelve pressure ports were modified to a new configuration to accommodate the Thermal Protection Adaptors.

# Breech Instrumentation



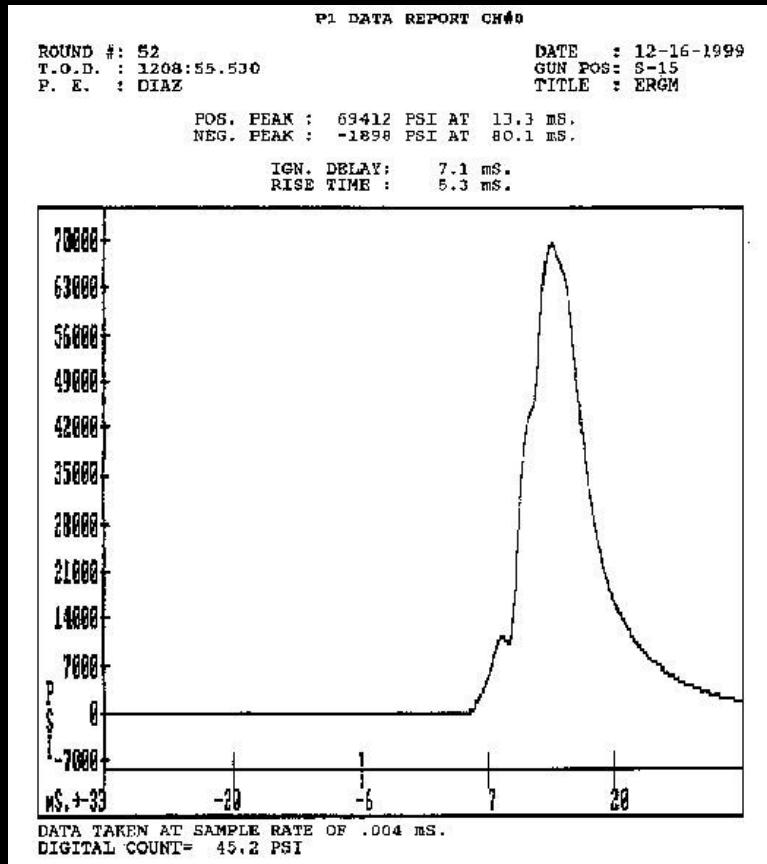
Cartridge Case mounting of E30MA and Mounting Adaptor. Transducers were assembled to Adaptors, greased and then installed in the Cartridge Case.

# Post Test Analysis



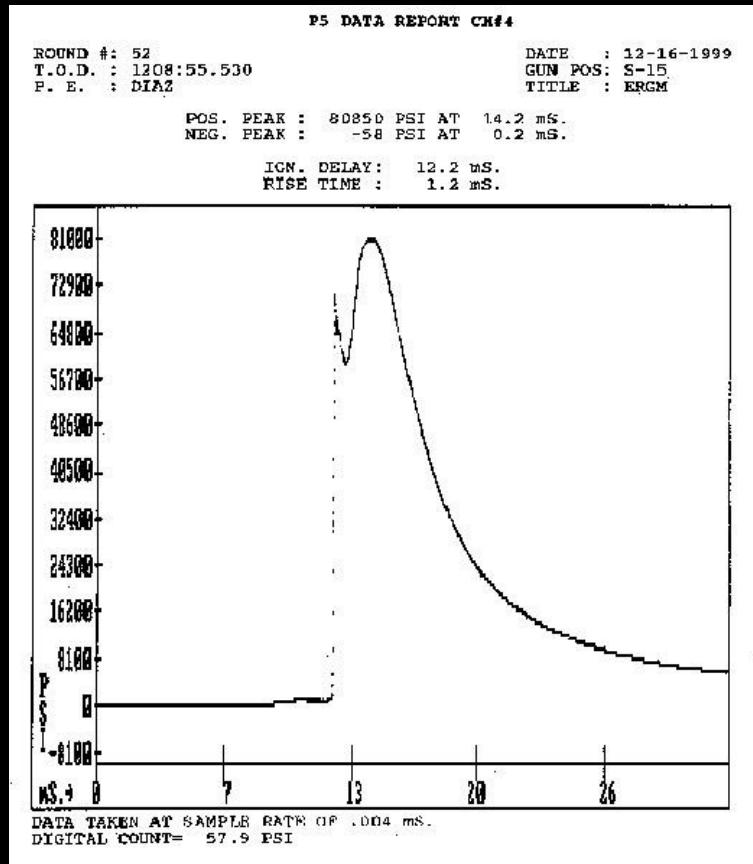
Thermal Protection Adaptors provided an added benefit of preventing residue impingement on the sensing element.

# Post Test Analysis



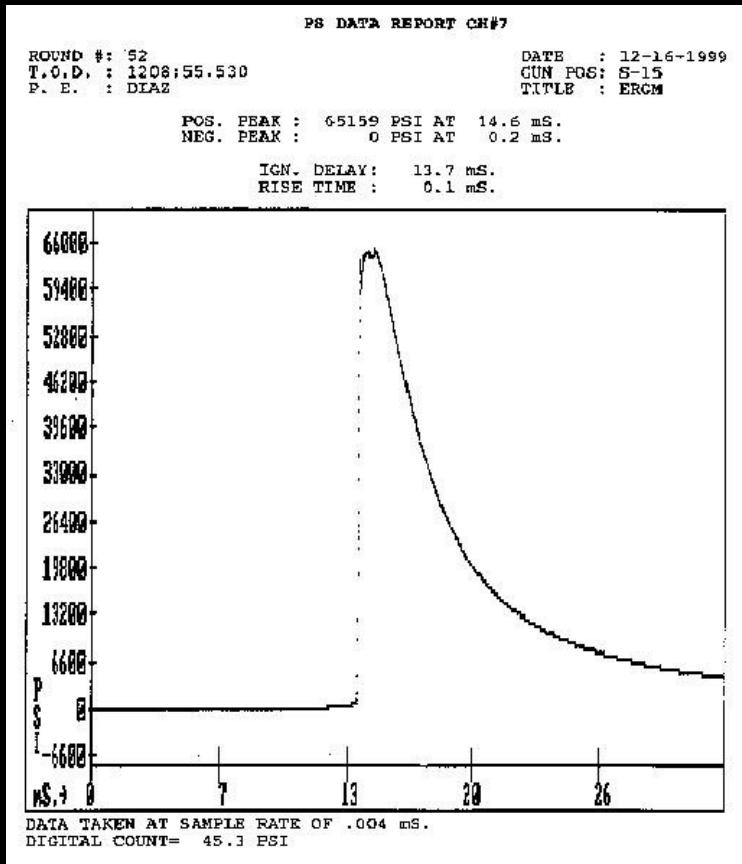
# Pressure Trace from Breech Mounted E30MA

# Post Test Analysis



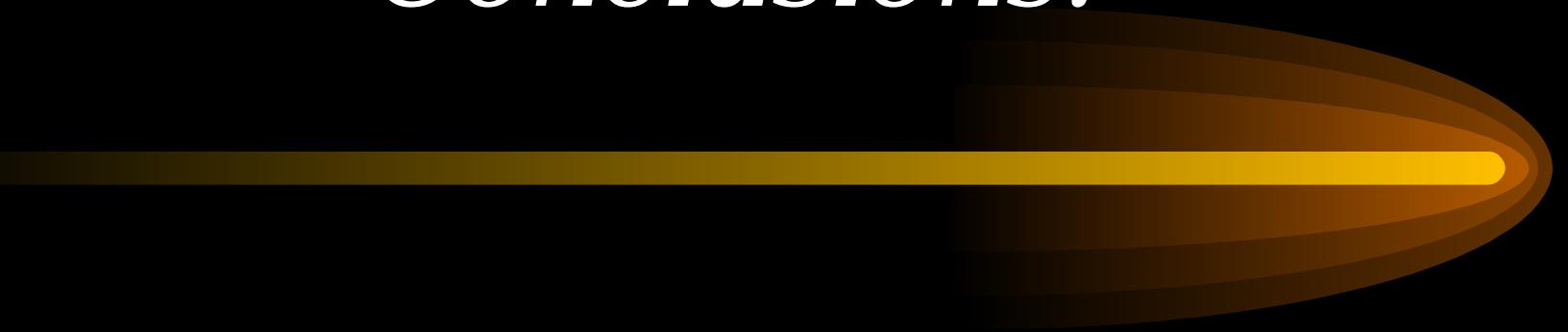
Pressure Trace  
from 73.5 inch  
RFT position.  
Spike is most  
probably from  
the sudden  
passage of the  
rotating band.

# Post Test Analysis



Pressure Trace  
from 93 inch  
RFT location.  
Oscillations at  
the top of the  
curve can lead  
to false peak  
pressure  
readings.

# *Conclusions:*



- US Army Model E30MP Transducers continued to provide usable data to the test sponsor.
- Creation of the Thermal Protection Adaptor afforded the use of previously manufactured sensors with no reduction in sensitivity and an improved level of sensor survivability and ease of use.
- Testing of other ordnance systems can benefit from these lessons learned.